

## COMPLETE LISTING OF THE CLAIMS

The following lists all of the claims that are or were in the above-identified patent application. The status identifiers respectively provided in parentheses following the claim numbers indicate the current statuses of the claims.

1. (Currently Amended) An interconnect system comprising:

a first circuit unit containing a first electronic circuit and a plurality of modulators,  
wherein:

the first electronic circuit produces a plurality of electrical output signals;

and

each a first modulator is controlled by a corresponding one of the electrical output signals and is capable of modulating a corresponding component of a first optical signal output from the first circuit unit; and

a second circuit unit containing a second electronic circuit and a plurality of detectors, wherein:

the second electronic circuit processes a plurality of electrical input signals;

and

each a first detector is capable of detecting modulation of a corresponding one of the components of the first optical signal to extract a first information stream corresponding one of the input signals.

2. (Currently Amended) The system of claim 1, wherein:

the second circuit unit further comprises a second plurality of modulators, wherein each modulator in the second circuit unit is capable of modulating a corresponding component of a second optical signal; and

the first circuit unit further comprises a second plurality of detectors, wherein each detector in the first circuit unit is capable of detecting modulation of a corresponding one of the components of the second optical signal to extract a second information stream a corresponding electrical signal.

3. (Currently Amended) The system of claim 1, wherein the first circuit unit further comprises:

a photonic bandgap crystal, wherein

~~the first modulator~~ each of the modulators comprises a ~~first~~ defect within the photonic bandgap crystal and an electrode adjacent to the ~~first~~ defect, wherein the ~~first~~

defect acts as a resonator for ~~a wavelength~~ the corresponding component of the first optical signal and has an optical property that varies with a voltage applied to the electrode.

4. (Currently Amended) The system of claim 1, wherein ~~the first detector~~ each of the detectors comprises a photodiode at a corresponding defect within a photonic bandgap crystal, wherein the defect acts as a resonator for ~~a wavelength~~ the corresponding component of the first optical signal.

5. (Original) The interconnect system of claim 1, wherein the first circuit unit is integrated on a first chip and the second circuit unit is integrated on a second chip.

6. (Original) The interconnect system of claim 5, further comprising a first light source that is external to the first chip and provides the first optical signal to the first circuit unit.

Claims 7 to 16 (Canceled)

17. (Currently Amended) An interface for input/output to/from an electronic integrated circuit, comprising:

a photonic bandgap crystal;

a line defect in the photonic bandgap crystal;

a first plurality of point defects within the photonic bandgap crystal, wherein each of the point defects acts as a resonator for a different wavelength of light in the line defect; and

~~an electrical element~~ a plurality of electrical elements respectively adjacent to the defect first plurality of point defects, wherein the electrical elements produce electrical input signals of the electronic integrated circuit from respective optical signals having the wavelengths resonant with the adjacent point defects;

a second plurality of point defects that respectively act as resonators for a plurality of different wavelengths of light; and

a plurality of modulators respectively adjacent to the second plurality of point defects, wherein the modulators respectively respond to electrical output signals of the electronic integrated circuit to modulate optical signals respectively having the wavelengths that are resonant with the adjacent point defects.

18. (Currently Amended) The interface of claim 17, wherein the ~~electrical element comprises an electrode~~ modulators comprise a plurality of electrodes respectively adjacent to the second plurality of the point defect defects, wherein each of the point defects in the second plurality defect acts as a resonator for a wavelength of an optical signal and has an optical property that varies with a voltage applied to the adjacent electrode.

19. (Currently Amended) The interface of claim 17, wherein each of the electrical element elements comprises a photodiode within the adjacent point defect.

Claims 20 to 39 (Canceled)

40. (Currently Amended) The interface of claim 17, ~~further comprising a plurality of point defects within the bandgap crystal and adjacent to the line defect~~, wherein each of the point defects acts as a drop filter for a different frequency of light.

41. (Currently Amended) The system of claim 3, wherein the first circuit unit further comprises a ~~second~~ line defect that acts as a waveguide for the first optical signal in the photonic bandgap crystal, wherein each of the defects in the modulators is the first defect being adjacent to the second line defect.

42. (Currently Amended) The system of claim 41, wherein ~~the first defect~~ each of the defects in the modulators comprises a point defect.

43. (Canceled)

44. (Currently Amended) The system of claim 1, wherein the first circuit unit further comprises:

a photonic bandgap crystal containing a plurality of defects, wherein each of the defects acts as a resonator for a different ~~wavelength of light~~ one of the components of the first optical signal, and a material in each of the defects has a refractive index that depends on an electric field in the material; and

a plurality of electrodes respectively adjacent to the plurality of defects, wherein ~~an electrical signal~~ the electronic output signals are respectively applied to one of the

electrodes ~~changes to change~~ the electric field ~~in a corresponding one of~~ fields in the respective defects.

45. (Currently Amended) The modulator of ~~claim 43~~ claim 44, wherein the material in the point defect comprises lithium niobate.

46. (Currently Amended) The system of claim 1, wherein the first circuit unit comprises:

a first waveguide for ~~an input of light optical signal~~ that includes a plurality of frequency components;

a plurality of drop filters positioned to respectively extract and separate the plurality of frequency components from ~~the optical signal in the first waveguide, wherein~~ [[; a]] the plurality of modulators are respectively associated with the plurality of drop filters, each modulator being capable of modulating the frequency component extracted by the drop filter associated with the modulator; and

a second waveguide into which the frequency components from the modulators are directed.

47. (Canceled)

48. (Currently Amended) The system of claim 1, wherein:

the second circuit unit further comprises [[:]] a photonic bandgap crystal containing a plurality of defects, wherein each of the defects acts as a drop filter for a different wavelength of light; and

[[a]] the plurality of detectors are respectively associated with the plurality of defects, wherein each detector generates an electrical signal that indicates a modulation of a light signal extracted by the associated defect.

49. (Currently Amended) The system of claim 1, wherein the second circuit comprises:

a waveguide for ~~an optical signal that includes the first optical signal as a frequency component; and~~

a plurality of drop filters positioned to respectively extract ~~a plurality of frequency~~ the components from of the first optical signal in from the waveguide, wherein ; and

[[a]] the plurality of detectors are respectively associated with the plurality of drop

filters, each detector being capable of detecting modulation of the ~~frequency~~ component corresponding to the drop filter associated with the detector.

50. (Canceled)

51. (Currently Amended) An interface of an electronic integrated circuit, comprising:

a waveguide for an optical signal that includes a plurality of frequency components;

a plurality of resonators adjacent to the waveguide, wherein the resonators respectively correspond to the frequency components, and each of the resonators provides a path for the corresponding frequency component; and

a plurality of electrical elements respectively associated with the resonators, wherein the plurality of electrical elements respectively implement transformations between the plurality of frequency components and a plurality of electrical signals of the electronic integrated circuit.

52. (Previously Presented) The interface of claim 51, further comprising a photonic bandgap crystal.

53. (Previously Presented) The interface of claim 52, wherein the waveguide comprises a defect in the photonic bandgap crystal.

54. (Previously Presented) The interface of claim 52, wherein each of the resonators comprises a defect in the photonic bandgap crystal.

55. (Previously Presented) The interface of claim 51, wherein each of the resonators comprises a drop filter that extracts the corresponding frequency component from the optical signal in the waveguide.

56. (Currently Amended) The interface of claim 55, wherein each of the electronic elements comprises a photodetector that generates ~~an electric signal a~~ corresponding one of the electrical signals from the frequency component extracted by the resonator.

57. (Previously Presented) The interface of claim 51, wherein each of the resonators feeds the corresponding frequency component into the waveguide.

58. (Previously Presented) The interface of claim 57, wherein each of the electronic elements comprises a modulator that modulates the frequency component that the associated resonator feeds into the waveguide.

59. (New) The system of claim 1, wherein the first circuit unit and the second circuit unit are integrated into a single device.

60. (New) The system of claim 1, wherein:  
the first circuit unit is in a first chip;  
the second circuit unit is in a second chip; and  
the first chip and the second chip are mounted on a substrate for transmission of the first optical signal between the first and second chip.

61. (New) The system of claim 60, further comprising a source of light in the first optical signal wherein the source is mounted on the substrate.

62. (New) The system of claim 1, wherein the first and second circuit units are integrated in a chip, and the first optical signal propagates from the first circuit unit to the second circuit unit within the chip.